



# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference GB020081	<b>FOR FURTHER ACTION</b> See Form PCT/PEA/416	
International application No. PCT/GB2004/001448	International filing date (day/month/year) 02.04.2004	Priority date (day/month/year) 09.04.2003
International Patent Classification (IPC) or national classification and IPC H04Q7/38		
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al.		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 11 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>		
Date of submission of the demand 09.02.2005	Date of completion of this report 24.03.2005	
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INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITYInternational application No.  
PCT/GB2004/001448

JC05 Rec'd PCT/PTO 06 OCT 2005

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))  
☐ publication of the international application (under Rule 12.4)  
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1, 6-10 as originally filed  
 2-5 received on 11.02.2005 with letter of 09.02.2005

**Claims, Numbers**

1-16 received on 11.02.2005 with letter of 09.02.2005

**Drawings, Sheets**

14-44 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages  
☐ the claims, Nos.  
☐ the drawings, sheets/figs  
☐ the sequence listing (*specify*):  
☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages  
☐ the claims, Nos.  
☐ the drawings, sheets/figs  
☐ the sequence listing (*specify*):  
☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/001448

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	1-16
	No: Claims	
Inventive step (IS)	Yes: Claims	1-16
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-16
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

see separate sheet

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following documents:

D1: WO 01/31945 A (TELCORDIA TECH INC) 3 May 2001 (2001-05-03)

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document): a method for scheduling transmissions of data from a plurality of remote devices (cf. page 6, lines 1-12), comprising the steps of scheduling a transfer period for transferring data from the device taking into account the wireless network signal strength of the device for the scheduled transfer period (cf. page 6, lines 21-26 and page 7, line 30 to page 8, line 26) and transfers the data at the scheduled transfer period. D1 implicitly discloses that the transfer period is computed including the start and end time in order to actually schedule the transmission (cf. page 9, lines 3-7 "bandwidth and duration").

The subject-matter of claim 1 differs from this known method in that before the transmission takes place, the transmission period is recalculated and the periods of other devices are recalculated if the recalculated period interferes with the periods originally scheduled for other devices.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as reducing the transmission failures produced by the independent scheduling of the transmission periods.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) because the transmissions periods are recalculated whenever any of the calculated periods interferes with the scheduled transmissions.

Claims 2-12 are dependent on claim 1 and as such also meet/s the requirements of the PCT with respect to novelty and inventive step.

Independent claims 13-16 contain features that are the equivalent features of claim 1.

The present claim 1 contains the subject-matter of the originally filed claims 1, 2 and 3 and therefore complies with the requirements of Rule 13.1 PCT.

10/552694

resource is used for non-ordered requests than for ordered requests. One way to order the downloads is to schedule them to come in at a certain times.

US Patent publication 0028313 discloses a distributed telemetry method and system affected by co-ordinating the taking of readings of a parameter by mobile phone users, the parameter readings being sent to a service system together with location information on the users. It is the task of a query scheduler to, amongst other things, organise when the reading of interest are to be taken. The reading is sent to the service system immediately or triggered by, for example, a scheduled time.

The problem with scheduled remote data logging is that simultaneous and multiple device upload of data can create overload on a server that collects such log data when the bandwidth is different from that predicted.

#### SUMMARY OF THE INVENTIONS

According to a first aspect of the present invention there is provided a data logging method as described in claim 1.

According to a second aspect of the present invention there is provided a data logging system for transferring log data to a server over a wireless network from a plurality of remote devices as described in claim 13.

According to a third aspect of the present invention there is provided a computer program product for transferring log data from a plurality of remote devices to a server over a wireless network as described in claim 14.

According to a fourth aspect of the present invention there is provided a service for consolidating log data from a plurality of remote devices to a server over a wireless network and supplying said consolidated log data on demand to a service requester as described in claim 15.

According to a fifth aspect of the present invention there is provided as described in claim 16 a service requester for receiving consolidated log data collected by a web service from a plurality of remote devices over a wireless network.

Suitably, when calculating the transfer period, the server transfer capacity is taken into account.

More suitably, an estimate is made using historical server transfer capacity data from a similar time period.

Preferably, for a particular device, more than one transfer period is calculated so that the data may be downloaded. Such a device is one existing in variable signal strength conditions.

More preferably the device alerts the server to the actual transfer size when or before transfer takes place. If the actual transfer size is significantly different to the predicted transfer size then the server recalculates the schedule.

Advantageously, the server stores wireless network signal strength for each client with respect to time.

More advantageously, the server makes an estimate of future wireless network signal strength for a particular client based on the signal strength at a previous time, for instance, the same time of day a week before. If the signal strength is acceptable for all or most of the scheduled transfer then the server can assume a low chance of interruption. Conversely if there is an interruption in this previous transfer, the server can assume a high chance of interruption.

Suitably, the server stores wireless position data for each client with respect to time and makes an estimate of future wireless network signal strength by estimating future position based on the present position, direction of travel, and speed of travel.

More suitably the method further comprising:

acquiring the actual wireless network signal strength before transferring log data; and

rescheduling the transfer period if actual wireless network strength is below a predetermined threshold.

Preferably, the method is performed on a device in a defined priority.

More preferably a device's priority is defined by its wireless network signal strength.

Advantageously a device's priority is defined by the quantity of data to transfer.

More advantageously, there is provided a reserve channel for service information. If a device finds that it has not been serviced but now has a need to transfer data. The device can proactively contact the server to request a higher priority of servicing. This request and data transfer needs to use an alternative channel of communication into the server and ensures that other lower priority tasks do not block its request.

Suitably, some devices do not have a scheduled download but download on demand. This allows for the benefits of an on-demand download as well as that from adaptive scheduling. Some devices may be deactivated, hence to not need to be included into the scheduling and planning system while in this state. They are treated as non-scheduled devices and data log download is on-demand and when available.

#### DESCRIPTION OF THE DRAWINGS

In order to promote a fuller understanding of this and other aspects of the present invention, an embodiment of the invention will now be described, by means of example only, with reference to the accompanying drawings in which:

Figure 1 is a schematic diagram of the present embodiment of the invention;

Figure 2 is a schematic diagram of a profile data structure stored by the present embodiment of the invention;

Figure 3 is a schematic diagram of a plan data structure stored by the present embodiment of the invention; and

Figure 4 is a method according to a first embodiment of the present invention.

**DESCRIPTION OF THE EMBODIMENTS**

Referring to Figure 1, a data logging system comprises: a server 300 connected over a mobile network to a plurality of remote client devices 100A...N. The first device is 100A, second device is 100B and so on up to 100N where N is of order a million devices. Each device 100A...N comprises: profile data 102; a device profiler 104; a data log 106; a device controller 108; and a data exchange 110. The server 300 comprises: profile data 301; a device profiler 302; a scheduler 304; a plan 306; an updater component 308; data exchange 310; a bandwidth forecast component 311; and an upload component 312. Log data is stored in a datastore 400.

Device profiler 302 maintains each device profile 102 collected from the client devices.

A device profile 102 includes characteristics relating to the device but not the download data itself. Referring to Figure 2, device profile 102 comprises two profiles for each device in the preferred embodiment:

**CLAIMS**

1. A data logging method for transferring log data to a server over a wireless network from a plurality of remote devices, said server for receiving data from the plurality of said devices, said method comprising the following steps:

scheduling a transfer period for transferring log data from a device to the server taking into account the wireless network signal strength of the device for the scheduled transfer period whereby the scheduled transfer period does not overlap a time when the estimated wireless network strength is too low to transfer the log data;

transferring data determined by its respective transfer period in the schedule;

selecting a device from the plurality of devices;

providing a transfer size for data to be transferred from the selected device;

calculating, for the selected device, a transfer period including a start time and an end time to transfer the log data to the server, the calculation using the selected device's transfer size and using transfer periods of other devices if known;

estimating, for the selected device, wireless network signal strength data for the calculated transfer period;

performing, for the selected device, the calculating and estimating steps again if the transfer period overlaps a period of time where the estimated wireless network strength is below a predetermined threshold;

storing the transfer period in a schedule.

acquiring the actual transfer size for a device before transferring the data;

recalculating the transfer period for the first device; and

recalculating transfer periods of other devices if the recalculated transfer period of the first device effects the transfer periods of the other devices.

2. A method as in claim 1, wherein, when calculating the transfer period, the server transfer capacity is taken into account.
3. A method as in claim 1 or 2 wherein, an estimate is made using historical server transfer capacity data from a similar time period.
4. A method as in claim 1 or 2 wherein, for a particular device, more than one transfer period is calculated so that the data may be downloaded.
5. A method as in any of claims 1 to 4 wherein, the device alerts the server to the actual transfer size when or before transfer takes place.
6. A method as in any of claims 1 to 5 wherein, the server stores wireless network signal strength for each client with respect to time.
7. A method as in any of claims 1 to 6 wherein, the server makes an estimate of future wireless network signal strength for a particular client based on the signal strength at a previous time.
8. A method as in any of claims 1 to 7 wherein, the server stores wireless position data for each client with respect to time and makes an estimate of future wireless network signal strength by estimating future position based on the present position, direction of travel, and speed of travel.
9. A method as in any of claims 1 to 8 further comprising: —  
  
acquiring the actual wireless network signal strength before transferring log data; and  
  
rescheduling the transfer period if actual wireless network strength is below a predetermined threshold.
10. A method as in any of claims 1 to 9 wherein the method is performed on devices in a defined priority.
11. A method as in claim 10 wherein the priority is defined by the wireless network signal strength of each device.

12. A method as in claim 10 or 11 wherein the priority is defined by the quantity of data to transfer of each device.

13. A data logging system for transferring log data to a server over a wireless network from a plurality of remote devices, said server for receiving data from the plurality of said devices, said system comprising:

means for scheduling a transfer period for transferring log data from a device to the server taking into account the wireless network signal strength of the device for the scheduled transfer period whereby the scheduled transfer period does not overlap a time when the estimated wireless network strength is too low to transfer the log data;

means for transferring data determined by its respective transfer period in the schedule;

means for selecting a device from the plurality of devices;

means for providing a transfer size for data to be transferred from the selected device;

means for calculating, for the selected device, a transfer period including a start time and an end time to transfer the log data to the server, the calculation using the selected device's transfer size and using transfer periods of other devices if known;

means for estimating, for the selected device, wireless network signal strength data for the calculated transfer period;

means for performing, for the selected device, the calculating and estimating steps again if the transfer period overlaps a period of time where the estimated wireless network strength is below a predetermined threshold;

means for storing the transfer period in a schedule;

means for acquiring the actual transfer size for a device before transferring the data;

means for recalculating the transfer period for the first device;  
and

means for recalculating transfer periods of other devices if the recalculated transfer period of the first device effects the transfer periods of the other devices.

14. A computer program product for transferring log data from a plurality of remote devices to a server over a wireless network, said computer program product comprising computer program instructions stored on a computer-readable storage medium for, when loaded into a computer and executed, causing a computer to carry out the steps of:

scheduling a transfer period for transferring log data from a device to the server taking into account the wireless network signal strength of the device for the scheduled transfer period whereby the scheduled transfer period does not overlap a time when the estimated wireless network strength is too low to transfer the log data;

transferring data determined by its respective transfer period in the schedule;

selecting a device from the plurality of devices;

providing a transfer size for data to be transferred from the selected device;

calculating, for the selected device, a transfer period including a start time and an end time to transfer the log data to the server, the calculation using the selected device's transfer size and using transfer periods of other devices if known;

estimating, for the selected device, wireless network signal strength data for the calculated transfer period;

performing, for the selected device, the calculating and estimating steps again if the transfer period overlaps a period of time where the estimated wireless network strength is below a predetermined threshold;

storing the transfer period in a schedule;

acquiring the actual transfer size for a device before transferring the data;

recalculating the transfer period for the first device; and

recalculating transfer periods of other devices if the recalculated transfer period of the first device effects the transfer periods of the other devices.

15. A service for consolidating log data from a plurality of remote devices to a server over a wireless network and supplying said consolidated log data on demand to a service requester, said service performing a method comprising the steps of:

scheduling a transfer period for transferring log data from a device to the server taking into account the wireless network signal strength of the device for the scheduled transfer period whereby the scheduled transfer period does not overlap a time when the estimated wireless network strength is too low to transfer the log data;

transferring data determined by its respective transfer period in the schedule;

selecting a device from the plurality of devices;

providing a transfer size for data to be transferred from the selected device;

calculating, for the selected device, a transfer period including a start time and an end time to transfer the log data to the server, the calculation using the selected device's transfer size and using transfer periods of other devices if known;

estimating, for the selected device, wireless network signal strength data for the calculated transfer period;

performing, for the selected device, the calculating and estimating steps again if the transfer period overlaps a period of time where the estimated wireless network strength is below a predetermined threshold;

storing the transfer period in a schedule;

acquiring the actual transfer size for a device before transferring the data;

recalculating the transfer period for the first device; and

recalculating transfer periods of other devices if the recalculated transfer period of the first device effects the transfer periods of the other devices.

16. A service requester for receiving consolidated log data collected by a web service from a plurality of remote devices over a wireless network, said service performing a method comprising the steps of:

scheduling a transfer period for transferring log data from a device to the server taking into account the wireless network signal strength of the device for the scheduled transfer period whereby the scheduled transfer period does not overlap a time when the estimated wireless network strength is too low to transfer the log data;

transferring data determined by its respective transfer period in the schedule;

selecting a device from the plurality of devices;

providing a transfer size for data to be transferred from the selected device;

calculating, for the selected device, a transfer period including a start time and an end time to transfer the log data to the server, the calculation using the selected device's transfer size and using transfer periods of other devices if known;

estimating, for the selected device, wireless network signal strength data for the calculated transfer period;

performing, for the selected device, the calculating and estimating steps again if the transfer period overlaps a period of time where the estimated wireless network strength is below a predetermined threshold;

storing the transfer period in a schedule;

acquiring the actual transfer size for a device before transferring the data;

recalculating the transfer period for the first device; and

recalculating transfer periods of other devices if the recalculated transfer period of the first device effects the transfer periods of the other devices.